WHAT IS CLAIMED IS:

1   1.   A method for generating faster discrete cosine transforms,

2   comprising:

3   arranging discrete cosine transform equations into at least one collection

4   having at least two discrete cosine transform constants;

5   scaling the discrete cosine transform equations in the at least one collection

6   by dividing each of the discrete cosine transform constants in the collection by one

7   of the discrete cosine transform constants from the at least one collection; and

8   representing each of the scaled discrete cosine transform constants with

9   estimated scaled discrete cosine transform constants approximated by sums of

10   powers-of-2.

2   The method of claim 1 further comprising separating an image into at

2   least one block and transforming the block into transformed data by performing

3   matrix multiplication on the discrete cosine transform equations based upon binary

4   arithmetic using the estimated scaled discrete cosine transform constants and

5   performing linear shifts and additions.

1   3.   The method of claim 1 wherein the scaling the discrete cosine

2   transform equations in the at least one collection by dividing each of the discrete

3   cosine transform constants in the at least one collection by one of the discrete

4   cosine transform constants from the at least one collection saves multiplications.

4. The method of claim 1 wherein the discrete cosine transform constant

2 chosen for scaling the discrete cosine transform equations in the at least one

3 collection is selected according to a predetermined cost function.

1 5. The method of claim 4 wherein the cost function minimizes a number

2 of add operations.

1 6. The method of claim 4 wherein the cost function minimizes a worst

2 case number of add operations.

1 7. The method of claim 4 wherein the cost function minimizes an error per

2 constant resulting from the approximations.

1 8. The method of claim 2 wherein the transforming the block into

2 transformed data further comprises using at least one set of one dimensional

3 discrete cosine transform equations.

1 9. The method of claim 8 wherein the discrete cosine transform constants

2 are obtained by splitting the discrete cosine transform constants into even and odd

3 terms by obtaining sums and differences of input samples.

1 10. The method of claim 2 wherein the block is an $N_1 \times N_2$ block.

1 11. The method of claim 10 wherein $N_1 = N_2 = 8$.

12. A data compression system, the data compression system comprising a discrete cosine transformer for applying a discrete cosine transform to decorrelate data into discrete cosine transform equations, the discrete cosine transform equations having been formed by arranging the discrete cosine transform equations into at least one collection having at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constant in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with estimated scaled discrete cosine transform constants approximated by sums of powers-of-2.

13. The data compression system of claim 12 further comprising a quantizer for quantizing the transformed data into quantized data to reduce the number of bits needed to represent the transform coefficients.

14. The data compression system of claim 12 wherein the discrete cosine transformer further separates an image into at least one block and transforms the block into transformed data using the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

15. The data compression system of claim 12 wherein the transformer executes equations that save multiplication operations, the equations having been formed by scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the at least one collection by one of the discrete cosine transform constants from the at least one collection.

16. The data compression system of claim 15 further comprising an entropy encoder for further compressing the quantized coefficients losslessly.

17. The data compression system of claim 12 wherein the discrete cosine transform constant used for scaling the discrete cosine transform equations in the at least one collection is selected according to a predetermined cost function.

18. The data compression system of claim 17 wherein the cost function minimizes a number of add operations.

19. The data compression system of claim 17 wherein the cost function minimizes a worst case number of add operations.

20. The data compression system of claim 17 wherein the cost function minimizes an error per constant resulting from the approximations.

21. The data compression system of claim 12 wherein discrete cosine transformer uses at least one set of one dimensional discrete cosine transform equations.

22.   The data compression system of claim 22 wherein the equations split

2   the discrete cosine transform coefficients into even and odd terms by obtaining sums

3   and differences of input samples.

1   23.   The data compression system of claim 14 wherein the block is an

2    $N_1 x N_2$ block.

1   24.   The data compression system of claim 23 wherein $N_1 = N_2 = 8$.

1   25.   A printer, comprising:

2   a memory for storing data;

3   a processor for processing the data to provide a compressed print stream

4   output; and

5   a printhead driving circuit for controlling a printhead to generate a printout of

6   the data;

7   wherein the processor applies a discrete cosine transform to decorrelate data

8   into transform coefficients using discrete cosine equations, the discrete cosine

9   transform equations having been formed by arranging the discrete cosine transform

10   equations into at least one collection having at least two discrete cosine transform

11   constants, scaling the discrete cosine transform equations in the at least one

12   collection by dividing each of the discrete cosine transform constant in the collection

13   by one of the discrete cosine transform constants from the at least one collection

14   and representing each of the scaled discrete cosine transform constants with

15   estimated scaled discrete cosine transform constants approximated by sums of

16   powers-of-2.

1   26.   The printer of claim 25 wherein the processor further separates an

2   image into at least one block and transforms the block into transformed data by

3   performing matrix multiplication on the discrete cosine transform equations based

4   upon binary arithmetic using the estimated scaled discrete cosine transform

5   constants and performing linear shifts and additions.

27.   The printer of claim 25 wherein the processor executes equations that

save multiplication operations, the equations having been formed by scaling the

discrete cosine transform equations in a collection by dividing each of the discrete

cosine transform constants in the at least one collection by one of the discrete

cosine transform constants from the at least one collection.

28.   The printer of claim 25 wherein the discrete cosine transform constant

used in scaling the discrete cosine transform equations in the at least one collection

is selected according to a predetermined cost function.

29.   The printer of claim 28 wherein the cost function minimizes a number

of add operations.

30.   The printer of claim 28 wherein the cost function minimizes a worst

case number of add operations.

31.   The printer of claim 28 wherein the cost function minimizes an error

per constant resulting from the approximations.

32.   The printer of claim 25 wherein processor uses at least one set of one

dimensional discrete cosine transform equations.

33.   The printer of claim 32 wherein the processor splits the discrete cosine

transform coefficients into even and odd terms by obtaining sums and differences of

input samples.

34.   The printer of claim 26 wherein the block is an $N_1 \times N_2$ block.

1   35.   The printer of claim 34 wherein $N_1 = N_2 = 8$.

1   36.   An article of manufacture comprising a program storage medium

2   readable by a computer, the medium tangibly embodying one or more programs of

3   instructions executable by the computer to use equations created by a method for

4   generating faster discrete cosine transforms, the method comprising:

5   arranging discrete cosine transform equations into at least one collection

6   having at least two discrete cosine transform constants;

7   scaling the discrete cosine transform equations in the at least one collection

8   by dividing each of the discrete cosine transform constant in the collection by one of

9   the discrete cosine transform constants from the at least one collection; and

10   representing each of the scaled discrete cosine transform constants with

11   estimated scaled discrete cosine transform constants approximated by sums of

12   powers-of-2.

1   37.   The article of manufacture of claim 36 further comprising separating an

2   image into at least one block and transforming the block into transformed data by

3   using discrete cosine transform equations based upon binary arithmetic using the

4   estimated scaled discrete cosine transform constants and performing linear shifts

5   and additions.

38.   The article of manufacture of claim 36 wherein the scaling the discrete

2   cosine transform equations in the at least one collection by dividing each of the

3   discrete cosine transform constants in the at least one collection by one of the

4   discrete cosine transform constants from the at least one collection saves

5   multiplications.

1   39.   The article of manufacture of claim 36 wherein the discrete cosine

2   transform constant chosen for scaling the discrete cosine transform equations in the

3   at least one collection is selected according to a predetermined cost function.

1   40.   The article of manufacture of claim 39 wherein the cost function

2   minimizes a number of add operations.

1   41.   The article of manufacture of claim 39 wherein the cost function

2   minimizes a worst case number of add operations.

1   42.   The article of manufacture of claim 39 wherein the cost function

2   minimizes an error per constant resulting from the approximations.

1   43.   The article of manufacture of claim 36 wherein the transforming the

2   block into transformed data further comprises using at least one set of one

3   dimensional discrete cosine transform equations.

1   44.   The article of manufacture of claim 43 wherein the discrete cosine

2   transform constants are obtained by splitting the discrete cosine transform constants

3   into even and odd terms by obtaining sums and differences of input samples.

45. The article of manufacture of claim 37 wherein the block is an $N_1 x N_2$ block.

1 46. The article of manufacture of claim 45 wherein $N_1 = N_2 = 8$.

1 47. A data analysis system, comprising;

2 a memory for storing discrete cosine transform equations having been are

3 formed by arranging the discrete cosine transform equations into at least one

4 collection having at least two discrete cosine transform constants, scaling the

5 discrete cosine transform equations in the at least one collection by dividing each of

6 the discrete cosine transform constant in the collection by one of the discrete cosine

7 transform constants from the at least one collection and representing each of the

8 scaled discrete cosine transform constants with estimated scaled discrete cosine

9 transform constants approximated by sums of powers-of-2; and

10 a transformer for applying the transform equations to perform a discrete

11 cosine transform to decorrelate data into discrete cosine transform coefficients.

1 48. The data analysis system of claim 47 wherein the transformer further

2 separates an image into at least one block and transforms the block into transformed

3 data by using the discrete cosine transform equations based upon binary arithmetic

4 using the estimated scaled discrete cosine transform constants and performing

5 linear shifts and additions.

49. The data analysis system of claim 47 wherein the discrete cosine

2   transform constant used for scaling the discrete cosine transform equations in the at

3   least one collection is selected according to a predetermined cost function.